MONTHLY REPORT OF THE OFFICES OF FOREST EXPERIMENT STATIONS AND DENDROLOGY
March, 1925

Foreword

The Use of Bibliographies

McCall - Experiments in Education

The time to make a survey of the bibliography on an experimental problem is the opposite of the time when the survey is all too frequently made. Often an investigator has completed his experiment and has prepared his manuscript for publication before he hurriedly collects a list of references. The prime function of a bibliographical survey is not to provide a dignified list of references to append to an article, but to serve as a practical guide to the formulation of the subordinate problems, and to the general planning of the investigation. Hence, the survey of the bibliography should immediately follow the formulation of the experimental problem or problems.

If there were no other reason, self-respect as a scholar should be adequate motivation for surveying a bibliography. Such a survey will avoid many public humiliations. Pride is not fostered by saying: "This is something never done before," only to discover later that claim to originality is unjustified. Such humiliations will be frequent enough at best without actually inviting them.

An initial bibliographical survey will prevent repeating an investigation already done. There are few things more important than the conservation of the time and effort of scientific men. The importance of avoiding repetition does not, of course, mean that it may not be desirable, on occasion, to verify a pervious investigation. But it is necessary to discriminate between ignorant repetition and conscious verification.

Again, a bibliographical survey will often suggest additional incidental problems to be settled. There are few men who have extensively engaged in research who cannot testify to many keen regrets because numerous subsidiary problems were conceived too late to make possible their solution at the time the major problem was being attacked. It frequently happens that merely minor modifications in an investigation will make possible the solution of five problems instead of one. The importance of conceiving these problems early can be appreciated when it is recalled that many of the world's greatest discoveries were by-products rather than major objectives of experimental investigations.

Again, a bibliographical survey helps by offering suggestions of procedure and of errors to be avoided. A bibliography is the recorded experience of previous investigators. The cleverest investigator is seldom able to make an experimental plan so perfect that there will be no subsequent regrets. Foresight is never a perfect substitute for experience. The bibliography reveals not only the methods employed and the instruments evolved by others but also criticisms of these on the basis of experience.

Finally, a bibliographical survey provides material which will be needed in describing the experiment conducted. It is desirable to preface an experimental article with a summary of previous related investigations, and to close it with a relevant bibliography. These, as well as all previously mentioned objectives of the bibliographical survey, should be realized at one and the same time.

The procedure of the bibliographical survey should be a highly selective one. The experimental problems are the key to this procedure. Throughout the survey, they should be kept in mind constantly. Everything relevant to them should be seized upon and examined for possible aids. Relevancy to the problems is the principle of selection; helpfulness in furthering the experiment, or its description, is the principle of retention.

Not the principles of selection and retention but the method of discovery is the chief difficulty in surveying a bibliography. The problem is to know where to look for material likely to be relevant. The method pursued will vary somewhat with the problem and the situation of the experimenter. The following general suggestions may, however, be given: Make inquiries of those who may be able to contribute unrecorded information. Make inquiries of those who may be able to suggest references to be examined. Go to the contents and references in books known to deal with the same or related problems. Consult the same and related topics in the library's topically indexed card catalog. Consult the table of contents of special periodicals. The discovery of a single relevant reference frequently leads to the discovery of many other references.

FOREST EXPERIMENT STATIONS

Washington

Washington Details

The end of March found both Show and Weidman in Washington on their details. During the month Show completed the evaluation of fire damage and the methods outlined will shortly be sent to the field for use during the fire season of 1925. It is hoped that general agreement will follow the plan as now outlined in order that all fire damages may be reported in a uniform and systematic manner. The application of his plan and figures when extended to the State protective forces as well as to the

National Forests will make possible uniform fire damage figures for the entire country.

In addition to the fire damage study, Show spent considerable time with the editors in re-working his requirements reports. Both of these have now been completed and are ready for publication.

Most of Weidman's time was occupied in administrative work. During the month he has been shaping up a number of reports, mostly from Priest River, and in assisting in the preparation of the large Program of Work for the investigative activities of the Forest Service. We hope to get this report out comparatively soon this year, its nonappearance last season being due to delays which would not permit mimeographing until very late in the year.

Weidman plans to leave Washington soon after the first of April to visit the Northeastern Station, particularly that he may visit the Petersham Forest. By going over this area with Prof. Fisher he hopes to take back to his region the message that it is possible to grow white pine profitably.

California Experiment Station Bill

For the first time in the history of the development of the experiment station work a separate bill for a forest experiment station passed Congress and was approved by the President. Senator Johnson's bill authorized the Secretary to establish a station in California but unfortunately the close of the session found Congress in such a jam that it failed to appropriate the necessary funds to make the station a fact. The District will continue to limp along on its present allotment.

Annual Investigative Programs

A considerable portion of the time of the Office has been devoted to the annual analysis of the Investigative Programs. Most of these came in during March and require much time in checking up projects which have been overlooked in the program or in following up the status of projects where incomplete records are given. Most of the stations have given considerable attention to the location and development of branch stations. All of the reports indicate the selection of a branch station is not the simple job that it first appears when subjected to critical review. Finding typical and representative areas is not a simple proposition.

Herbarium Specimens

In the past a large number of plant specimens have been received for identification. Many collections contain fragmentary specimens and recently one large collection contained sufficient material to make exact identification possible of only a few plants. The attention of the Stations is therefore invited to the necessity of preparing the specimens in such a way that those doing the plant identification may have the best possible opportunity of having adequate specimens. There are occasions

when it is not possible to secure all of the material requested by the office, but these cases should be reduced to the minimum.

Swedish Bark Measuring Instrument

The bark measuring instrument devised by the Swedish Forest Experiment Station is a piece of equipment which most of the Stations should possess. It is particularly valuable in volume table studies for it assists materially in speeding up the work. It is a decided improvement measuring bark thicknesses by ax cuts and it insures greater accuracy. The instrument has limitations, however, in very thick bark and particularly when used with those species where considerable resin is encountered. The only disadvantage is the tendency to gum and stick, but this can be obviated by regular cleaning.

R. M. Brown Goes to Lake States Station

The first of March R. M. Brown, who has been in charge of the work of Forest Mensuration for the last couple of years, left Washington to become a member of the Lake States Station. His place was taken by L. H. Reineke from the Appalachian. Although having limited experience in forest mensurational work, Reineke brings with him an intimate knowledge of troubles the Appalachian Station has had in the preparation of volume and yield tables. Upon his arrival he was initiated into the mysteries of partial and multiple correlations.

Forest Measurements

Most of the time of the Section of Forest Measurements has been spent in the preparation of the regional volume table for the western yellow pine. This study, which has been hanging fire for several years, is the next big job that the section is undertaking, as the bulk of the southern pine yield study is now out of the way. Additional time in the Section was spent also on the southern white cedar study and in miscellaneous work. The Standardization Committee got out its first memo. asking for agreement of the members. Replies are coming in. Bruce is working now on the second installment to be sent out in April.

Tabulating Section

Show's statistical fire study for D-5 occupied a full one-third of the time in the Tabulation Section. In addition, the fire study for the Northeastern Forest Experiment Station required one-fifth of the total time. Considerable time was also spent on the stumpage price study and on the growth study of cut-over spruce lands. Miscellaneous items, such as the southern pine growth study, the Wisconsin timber survey, and log prices filled in the balance of the month.

Statistical Work

Miss Meynes has been preparing the annual statistical report based upon the cooperative fire warden reports from those States which are without a local forest organization. In addition to this, one-third of her time was spent

[illegible] possibility [illegible] possible all of the [illegible] [illegible], but these errors could be reduced to the minimum.

[illegible] Entertainment

The band accompanying instruments devised by the Scottish Pipers [illegible] is a pipers of [illegible] which many of the Highlanders would prefer [illegible] to [illegible] [illegible] [illegible]

on the annual statistical reports from the Districts. It is surprising how few of these reports are prepared correctly. The checking of manuscripts, of which there has been a veritable deluge in Washington this past month, also required about one-third of her time.

EDITOR'S OFFICE

The Preparation of an Outline---I

An outline is a good deal like the reducing glass that a draftsman uses in order that he may see how his work is going to look on the printed page - whether it will be well balanced, have proper emphasis, and be legible when reduced. It gives him a perspective on his work that otherwise he would not have until it was printed, too late to be of any use. I do not know of any better description than this of the place and purpose of an outline in the preparation of a bulletin or printed report of any kind.

An outline, in other words, is a good deal more than a table of contents, or a skeleton of what has been written, such as is too frequently only sketched out after the report has been completed. The "reducing glass" is not needed so much for the written report as for the project as a whole. It should be applied, not to what is written or is to be written, but to what has been accumulated as the basis of the writing. Its purpose is to show you and those who must review your work what you intend doing with your data. Presumably your written report will follow the general lines of your outline - not because in making the outline you have in any sense predetermined the course of the report, but because, in the process of constructing the outline you have already applied the reducing glass to the project and the mass of accumulated data and have determined what the data show or do not show, how you are going to present these findings, and what is truly important in this contribution of yours.

But the preparation of the outline does not begin with setting down a number of topics in various degrees of indentation and with different numbers and letters preceding them. It really begins with your first essay at digesting your facts.

Before the outline is sketched out, there should be a sincere effort to state the scope and purpose of your report in a single, not too complex sentence.

This sentence will contain the meat of your report, highly compressed. Your outline will be in effect an expansion of this sentence. If your material, your notes, data, tables, charts, are not properly digested, the sentence-test will be a failure. If you do not find it possible to state your report in a single sentence, it may be that the report you are writing is of such an unusual nature that the sentence-test does not fit; but the probability is very high that you do not really know what you are writing about - that you are seeing the trees instead of the forest.

A stray example or so will make this clearer. Take any recent bulletin and see to your own satisfaction how this test applies. For example, Bulletin No. 1264, the recent report by Korstian and Baker on "Forest Planting in the Intermountain Region." What the writers have to say here might be stated in a single sentence somewhat as follows:

> Reforestation in the intermountain region must be achieved, not by direct seeding, but by planting at a favorable time and on favorable sites vigorous nursery-grown stock capable of overcoming the peculiar difficulties of this region.

It is not so difficult to see how this sentence is expanded into an outline indicating more definitely the treatment of the subject already fairly clearly defined. It is obvious, for instance, that the emphasis of the sentence is on planting, just where the authors want it. Accordingly, in the outline, and later in the bulletin, seed sowing is dismissed in a sentence or two. The development of planting is then along the line of necessary qualifications, as time, site, class of stock, with a needful consideration of climatic and soil requirements. But the point to be made is that I could not state Bulletin 1264 in a sentence if the data accumulated by the authors had not been properly digested before the bulletin was attempted.

It begins to be apparent that the work done after the data have been collected and before any outline is attempted is of great importance. By the employment of every means of arrangement and combination of the data, in tables and in graphic form, it should be finally possible to arrive at definite conclusions regarding what the data do actually reveal, what is the relative importance of the findings, and which are important in view of the original inquiry and the purpose of the project. Eliminating stringently those details that are not constructively relevant, the author finds himself ready to put on paper what he actually has to say. If he is not sure of his arrival at that point, the attempt to put into a sentence what he thinks he has to say will soon clear up his doubt, one way or the other.

DENDROLOGY

Federal Horticultural Board Activities

When the Federal Horticultural Board began some ten or more years ago to safeguard the United States against further infestation by the Pink Bollworm, which came first from Mexico to south-central Texas, it placed a quarantine on Mexico, shutting out all cotton products. Its second move to protect the country against the likelihood of this past coming in raw cotton from Egypt and other foreign countries, required their cottons to be fumigated by cyanogen gas before entering.

In the meantime, despite vigorous efforts by the Federal Horticultural Board and Texas officials, the Pink Bollworm has spread from south-central to southwestern Texas, where in the Big Bend section of the Rio Grande the insect is now abundant. Border counties in New Mexico have been slightly infested, but in the latter, however, the pest is now practically stamped out. It is chiefly in the Big Bend portion that the Pink

Bollworm has a strong foothold, but in relatively small fields remote from rail centers. Here the presence of the insect is due to the constant smuggling of Mexican seed into those border sections, where it is difficult to control smuggling. However, in the great border bottoms known as the El Paso Valley, extending to Brownsville, lies an increasing acreage of cotton now only very slightly infested. Here, although parallelled on the Mexican side by increasing cotton growing, the Texas State and Federal authorities are able to apply more effective control against smuggling, and as a result only a small, very scattered infestation exists on the American side.

To safeguard Texas all Texas raw cotton is now required to be ginned by machines equipped with heat sterilizers, which, without destroying the vitality of the seed, kills the Bollworm - that is, if the sterilizers work efficiently. As a matter of fact, however, the Board finds that they have an efficiency of only about 75 or 80 per cent. Moreover, the ginners are not in sympathy with this requirement, because it delays speedy ginning, and reduces profits. One ginner was caught red-handed letting the seed through (after ginning) without passing it through the sterilizer. Both the ginners and a good many Texas cotton farmers are still unconvinced that the Bollworm is a menace.

It is still further required as a safeguard that all cotton seed produced within infested areas must be consumed there, some of it being crushed at accessible oil mills and some of it being fed to cattle. Further control of possible spread of the worm by the movement of cotton lint from infested territory is effected by allowing such cotton to leave the State only by export, from the ports of Houston and Galveston. Cotton is allowed to move to these ports only in early winter when the insect is dormant in the few seeds always left in ginned cotton, and not likely to escape from cotton bales.

On the whole, it is felt now that the more or less effective sterilization of cotton seed from infested areas, and the movement of cotton lint from the same territory only in export trade, are holding the Pink Bollworm in check, while in some formerly infested localities, distant from the Rio Grande Valley, extermination seems also to have been effected. Nevertheless, the Board feels now that still more strict measures should be taken for the control of cotton and seed from known infested and suspected areas.

With such recently established effective measures the Board now admits into the United States ginned cotton from the Rio Grande border lands opposite infested areas, provided it goes in bond direct to border Texas fumigation plants for immediate treatment under Federal supervision. While the border Mexican gins are required to be equipped with heat sterilizers, no Mexican seed is admitted to the United States. Movement of Mexican cotton into our trade (after fumigation) is subject to immediate removal by rail from the fumigation plant to sale points out of Texas; or, if to be held after fumigation, it must be stored in insect-tight storage compartments and apart from all other cotton, until it is moved out of the State for marketing.

At this time the Board regards it imperative also that all Texas cotton produced within infested or suspected areas should be fumigated as a requirement for movement either within or outside the State. Moreover, it feels that all seed from known infested areas in Texas should be 100 per cent sterilized before it is allowed to move to oil mills for crushing or to be used for planting or feeding. In the present arrangement for the movement of Texas cotton into export there is more or less danger of such shipments infesting new territory when in transit to these ports.

The Board has felt for some time that the handling of Texas cotton from its infested and suspected territory has not been consistent with the air-tight control applied to the entrance to this country of all foreign-grown cottons. The entrance of Mexican cotton is now similarly safeguarded. With comparable Pink Bollworm infestation within the State of Texas, a consistent policy requires that all cotton produced there be handled under the same rigid control. The Board's job is not only to help Texas to safeguard its cotton industry, but also to guard the interests of other States. At the present time perfect cooperation in this matter does not exist between Texas cotton farmers and State and Federal officials. However, the farmers seem likely to accept fumigation of their cotton which will give them markets aside from export throughout the United States. But (through ignorance) they believe the present imperfect seed sterilization to be effective. It is believed that the Board will be able to bring about arrangements with Texas officials for the control of the cotton and seed movement within the State.

APPALACHIAN FOREST EXPERIMENT STATION

General

The February meeting of the Appalachian Forest Research Council left an aftermath of correspondence, minutes, resolutions, committee reports, etc., which extended over into March. The station's annual investigative report and program for 1925 were practically completed during the month, and a plan was sketched for the development of the station for a period of ten years. In the latter, the item of most immediate interest was the proposed field laboratory and test station on the Pisgah National Forest at Bent Creek. On account of the present lack of facilities for laboratory experiments and of provision for field control of other investigations, this field station is the most urgently needed of all improvements. Such a station, when established, will serve also as field headquarters for other investigators, notably the cooperators from the Offices of Forest Entomology and Forest Pathology. Dr. Craighead, of the Office of Forest Entomology, visited the site during the month, with Frothingham, and began a series of operations in second-growth shortleaf pine timber to study the factors governing attacks by the southern pine beetle.

Other visitors during the month were J. F. Preston, formerly of the Forest Service and now with the Hammermill Paper Company; S. B. Show of the California District, U. S. Forest Service; S. J. Hall of the James D. Lacey Company; and L. F. Pratt, of the Gearhart Timber Estimating Company. Assistant Silviculturist W. R. B. Hine, of the Southern Forest Experiment Station, with field assistants Averell and Tinker, visited the Appalachian Station for a few hours to confer with reference to their field work on fire damage and methods of cutting studies in eastern North Carolina and Virginia.

With the approval by the Secretary of Agriculture of the plan for cooperation with Yale University on the study of the germination and early survival of important American oaks, the way has been cleared for the continuance of this project under extremely satisfactory conditions. Korstian, who has been assigned to the project, will begin work at New Haven next September, remaining there until the end of the school year. Laboratory and greenhouse facilities have been offered by Yale University. Not the least interesting part of the agreement is that Korstian's work at Yale will apply toward a Ph. D. degree.

As a means of stimulating interest in forest fires among school children, McCarthy last fall offered small cash prizes for essays on the subject of "The Red Enemy." The competing essays were received and judged during the month. Mr. C. I. Peterson, District Fire Warden of the North Carolina Service, aided and abetted in this enterprise, and a large amount of newspaper interest was exhibited in various towns within the district affected.

Mr. Archie Budd, of Philadelphia, joined the staff as a temporary assistant during the month. Mr. Budd will continue his forestry career at the Cornell forestry summer school next summer.

Study of Fire Damage (Pf-4)

McCarthy spent a week with Hines' party from the Southern Station on a study of fire damage in pine in the coastal plain region of North Carolina.

The longleaf section of North Carolina is still generally subject to repeated fires. This makes difficult the task of determining the growth rate which can be expected when stands are protected from fire. A few areas were found, however, which had not been burned in several years, and these were used to check the damage resulting from fire on adjacent burned areas. Height measurements and diameter increment borings clearly showed that longleaf pine is retarded by fire for one or two years at least. This species has been making good headway in reproducing the cut-over areas where seed trees are present and this in spite of periodic burns. Longleaf pine suffers less from fire than the associated species, the result of fire being to create pure longleaf stands. Fire injury is most severe in two stages: the seedling in its first season, and when 6 to 18 inches high. Successive fires are destroying the boxed pine trees, which on many areas are the only available seed trees. McCarthy was especially impressed by the recovery of young longleaf pines which had been browned by fire.

Loblolly pine 100 feet high was found which had been burned to the top by a recent fire. Two hundred and fifty trees were tagged in this stand for future examination.

Natural Regeneration of Oaks (Mr-2)

With the budding of spring, came the necessity for renewed activity in the study of factors influencing the germination and early survival of the important oaks. Korstian accordingly planted in the Champion Fibre Company's nursery all of the red, black, white, and chestnut oak acorns which had been stored in various places and under different conditions. Many of the stratified acorns were already sprouting. To be generally successful, a method of over-winter storage must provide that the acorns be kept continuously moist and at the same time at a relatively low temperature.

A great avidity for acorns on the part of the rodent population of the forest has come to light as an incidental result of the tests under way at Bent Creek. The rodents burrowed under the screens and have gradually gridironed the beds with their burrows.

Korstian also spent some time in a field study to determine more specifically just what happens to the acorn crop, and to what extent and

under what natural conditions germination actually occurs. In some cases over 90 per cent of the total production of acorns was consumed by animals. Among the mammals and birds known to feed upon acorns the following may be listed: deer, cattle, hogs, squirrels, chipmunks, rabbits, mice, turkeys, jays, and robins. Besides the losses from these sources, a significant percentage of the crop is also destroyed by insects.

Many of the acorns which escape the rodents and insects are subjected to drying out, resulting in the loss of viability or the death of the newly germinated seedling. No unsprouted viable white or chestnut oak acorns have thus far been found this spring. In situations adequately protected by leaf litter or other moisture-conserving cover there may be found seedlings of these species which germinated and became rooted last fall. A large number of acorns may germinate on bare soil during rainy or humid weather; but many of these, whose roots are unable to keep pace with the downward dessication of the soil, perish during subsequent dry periods in the fall and winter. In the absence of a protective covering of either snow or leaf litter, the hazard is further increased by frost heaving.

Unlike the white oaks the red and black oaks germinate in the spring, beginning as early as February. Because of their thicker shells and higher oil content the acorns of the black oak group are less susceptible to drying; but they are still in need of the protective influence of the leaf litter during the winter.

The seed beds planted to acorns in the Champion Fibre Company's nursery at Canton, N. C., fortunately have been protected from rodents, and some lots of acorns are already showing considerable germination. Other lots are not expected to germinate because of the special treatments given them, such as storage under dry, warm conditions and subjection to excessive heat.

In connection with the laboratory and greenhouse experiments to be undertaken next winter in cooperation with Yale University, it has seemed desirable to secure reliable information as to both the amount and duration of excessive heat to which the acorns are subjected in forest fires. Readings at intervals of 15 seconds - at about 20 stations on three different fires - were taken by means of the thermocouple and potentiometer which were kindly loaned to us by the Pacific Northwest Forest Experiment Station. Records on the first Bent Creek fire were taken by Frothingham, Show, Dr. Craighead and Korstian, on the Bee Tree fire by McCarthy, District Forester Peterson of the State Forest Service, and Korstian; and on the second Bent Creek fire by Korstian and Haasis. From these records it will be possible to select a series of heat treatments to use in the laboratory study of the resistance of acorns to excessive temperatures. They will also be of value to McCarthy in his study of fire damage.

The work done on this study thus far points to the great importance of preserving the leaf litter on the forest floor as a protection to the acorns on areas wherever natural regeneration of oak by seed is desired. These results indicate that, where natural regeneration of oak by seed is

desired, optimum seed-bed conditions can be brought about by a form of partial cutting, either the shelterwood or selection methods. This conclusion will be particularly significant in connection with the natural replacement of chestnut by oak on sites above the yellow poplar belt in the Southern Appalachians.

Study of Importance of Range Grazing (Pa-1)

Haasis spent a few days on correspondence and interviews in connection with this study. A review was made also of the grazing permits issued by the Pisgah National Forest for the years 1917-1934. There has been considerable fluctuation in the number issued from year to year but no pronounced trend is shown.

FREMONT EXPERIMENT STATION

The activity of both Roeser and Bates during March has been confined quite largely to the growth-study report, this being now largely shaped except for the detailed consideration of three sets of Douglas fir plots. Owing to the advent of the field season, however, the finishing touches on the report will probably require a month or more.

At the end of the month Bates completed the manuscript of a 16-page leaflet descriptive of the Experiment Station work. This is written in a popular style, considerable thought having been given to the psychology of the average station visitor who will be likely to pick up the leaflet. The next most important step is to insure its printing in an attractive form. The leaflet contains five cuts.

During the month the proposed goat grazing on the denuded watershed at Wagon Wheel Gap has been arranged for, a contract drawn up to be signed by the owner of the goats, and funds provided for the small expense which will be incurred before June 30. It is planned to graze the goats from June 15 to October 15 in case they do not starve before the latter date.

Some attention has been given to the encouragement of tree planting on the plains of eastern Colorado, especially by the schools, many of which have splendid buildings entirely unadorned by grounds.

By far the most important topic locally is fire weather, which has naturally revived an interest in fire studies. At the end of March the Director has prepared a statement for the District Forester which brings out sharply the cause for an acute fire situation in the Pikes Peak region. This shows that since June 1, 1924, there had not been a month with normal precipitation, the deficit increasing steadily to 9.00 inches, where a total of 16.97 is normal. In marked contrast is Collbran, Colorado, picked at random from western slope stations, which shows an excess of 4.16" for the nine months ending with February. Sheridan, Wyoming, has been just about normal for the same period, there being some excess since October last.

With the season advancing rapidly, Roeser and Bates will repair to the station early in the month to get spring activities under way. Of these, the potting of several hundred trees for a comprehensive transpiration test is one which will involve the greatest amount of labor. One thing is certain, and that is that the proposed paper pots must not be used for the entire experiment until they have been given some trial. Therefore, a compromise plan will be followed this year, in which use can be made of available galvanized iron cans.

Beyond this one project, and the planting of some of the breeding-experiment stock, the individual activities are too varied to deserve special mention.

LAKE STATES FOREST EXPERIMENT STATION

Several interesting developments may be reported. The Minnesota State Forest Service held a meeting for two weeks at the University Farm at which almost all of the State forestry personnel were present. They concentrated their time in large part on fire protection and law enforcement. Zon gave one talk on timber marking policy. Mitchell gave two talks presenting certain phases of his work on fire statistics and fire weather respectively.

The first two weeks of the month were spent by Zon in Wisconsin and Michigan. He talked before several local organizations in Madison, Milwaukee, Grand Rapids, Ann Arbor, Marquette, and Negaunee. He also discussed, at Madison and Lansing, tentative plans for cooperation by the States with the Experiment Station. Final arrangements can only be made later after the State legislatures have passed the appropriations. At Marquette, the matter of a donation of land in the Upper Peninsula of Michigan as an experimental and demonstration area, and probably center of work for the Experiment Station, was discussed with officials of the Cleveland Cliffs Iron Company. The prospect of favorable action on this matter is good as soon as certain legal matters are cleared up.

The last part of the month Zon has been revising the Report on Timber Growing and Logging Practice in the Lake States.

Certain State forestry matters are worth mentioning. Michigan has adopted an extended program of reforestation on State lands. The Minnesota legislature has again passed the Amendment to the State Constitution enabling the enactment of laws for modified taxation of forest lands. Wisconsin has not passed an act by which the Government may purchase lands within the State for national forest purposes. The provision for $2500 appropriation by Minnesota for extension forestry has been eliminated. The Upper Peninsula Development Bureau of Michigan, and the State Extension Leader for that part of the State, E. G. Amos, assisted by Extension Forester, Kroodsma, have entered upon a plan of establishing fifteen experimental and demonstration planting areas in the different counties of the Upper Peninsula. The skids by which the plan was kept moving and by which the Experiment Station, the State Forester, the Universities, and others were brought into it, were ably greased by the pen of P. S. Lovejoy. The Experiment Station contributed suggestions as to the species and technique of establishing the plantations.

The fire project is going forward with the compilation of the 1924 statistical data from Minnesota and Michigan. The fire weather data is also being assembled. The compilation of the precipitation data for Minnesota is about two-thirds completed.

R. M. Brown reported on March 16, making the fifth permanent technical member of the Experiment Station staff. He is assisting Wackerman with the preparation of the jack pine yield table. His experience in the developments

in connection with the southern pine yield study have been the subject of some discussion of methods and the desirability of modifying the working plan for jack pine to take advantage of the suggestions. Volume tables for the jack pine project have been completed, and separate volume tables are proposed for use in the different parts of the region until a further check can be made on the differences in form which seem to exist in the different parts of the region. Progress is being made on the preparation of the yield tables.

W. L. Barker of the Superior Forest spent three days at the office on the preparation of the working plan for a working circle on that forest. An interesting and profitable discussion of the silvicultural and regulation matters in the plan was participated in by all members of the station staff.

Mr. S. R. Gevorkiantz is trying to find a measure of the comparability of yields of different species so as to preserve the individuality of form of the stands, by the use of the forest form factor and shape of the total volume growth of all the trees in the stands expressed as a solid of revolution.

CLOQUET FOREST EXPERIMENT STATION

March saw the break-up of the winter in the north. This is comparatively early as normally it does not happen until early in April. With the break-up of winter, the logging operations at the station ceased entirely. There was landed at the mills in Cloquet 59,490 board feet of jack pine; 420 board feet of white pine; 5,320 board feet of tamarack and 6,570 board feet of Norway pine.

The operations also yielded 25 double cords of jack pine pulp and 5 double cords of spruce pulp. In addition, there was salvaged from the tops and dead and down material over 100 cords of firewood cut into three-foot and sixteen-inch length. That needed for use at the station will be reserved and the remainder sold. A ready market exists for this material and people are very glad to do their own hauling.

The second field season for the junior students in their management work at the Cloquet station started on the 30th of March. There are 15 students present this year and work is already well under way.

The instructional duties of the Cloquet staff were completed at the end of the winter quarter. Most of the time now is being taken up with planning the coming season's work and in getting ready for the spring nursery season.

Senator J. E. Diesen of the Minnesota legislature introduced an act authorizing the station to distribute forest planting stock at cost, plus 10 per cent. The fate of this bill is still uncertain. Should it get out of committee, it has every opportunity to become a law. In the meantime, surplus stock is being disposed of as usual.

Behre completed the manuscript of his article on Farm Class Taper Curves and Volumes and their Application. As soon as the charts to accompany it, which are now being made in the Washington office, are completed, the manuscript will be ready to circulate for comment. As a member of the Joint Committee on Standardization of growth and yield studies, Behre also reviewed carefully the suggestions for the standardization of volume table procedure. This resulted in the preparation of a substitute plan proposing standardization of volume table construction by the percentile form class taper curve system. This system appears to have certain important advantages over the conventional system proposed, particularly from the standpoint of accuracy and simplicity. It is applicable as standard practice irrespective of whether the final volume tables are prepared with or without the use of a formula. The substitute proposal is being circulated among the other members of the committee.

Westveld sent to Washington for listing and tabulating on the tabulating machine a large amount of material pertaining to the growth on the temporary sample plots which he took last summer in connection with his spruce reproduction study. The results were returned promptly and are proving extremely valuable in working up the data. Westveld has also been working up lists of projects which private owners might be willing to undertake in cooperation with the Experiment Station, and a set of instructions for the establishment of permanent sample plots in connection either with these projects or with investigations by other agencies.

Cutting of the permanent sample plots established last summer on the White Mountain National Forest has been completed to our great relief. At one time it looked as if the unusually warm spring and the curtailment of cut by the operator might result in leaving the plots in a half cut condition. Stickel has been placing the sample plot data in permanent form and preparing charts both of the entire plots and of the intensive reproduction plots.

Stickel has also been handling the revision of the census of forest investigations in the Northeastern States issued in mimeographed form last year. Various changes in existing projects are being recorded and a number of new ones have been unearthed. About three-quarters of the returns are now in.

Meyer has been making satisfactory progress on his spruce yield study. In connection with this hs raised a number of questions in regard to the Memorandum on the Preparation of Yield Tables for the Southeastern Yellow Pine study recently received from Washington. Spruce quite evidently differs from Southern pine in several ways, such, for example, as in the fact that in certain portions of the spruce region second-growth stands of red spruce are seldom pure, but consist of mixtures with balsam fir and white spruce, and has a different distribution of diameter classes. Some of these differences will apparently make desirable certain modifications in the methods used in the Southern pine study. As a basis for rejection of abnormal plots, the standard deviation of basal areas was computed to be 11.9%, considerably less than that obtained by Southern yellow pine,

although greater than that for the southern white cedar. Meyer has also worked out a slightly different and simpler method of anamorphosis which is apparently of general application. He has been able to use to good advantage the 50 red spruce plots taken by Murphy some years ago, and several of the Forest Service permanent sample plots established at Corbin Park, New Hampshire, in 1905. Remeasurements of the latter are due this year.

Meyer and Dana spent a day on the famous Rainbow plantations in northern Connecticut in company with representatives of the Yale Forest School and of the Connecticut Agricultural Experiment Station. The plantations occupy approximately 100 acres of abandoned farm lands, consisting chiefly of a comparatively fine sand. The original plantings consisted of a wide variety of conifers and hardwoods, and resulted in almost complete failure of the latter. Red oak alone is doing well in several places. Chestnut and black locust would probably also have done well had it not been for the chestnut blight and the locust borer. Of the conifers, red and Scotch pine, so far, show up best both in diameter and height growth. White pine has been badly weeviled, and on the whole does not equal the other species in diameter growth. Plantations are for the most part from 20 to 24 years old with subsequent filling of failed places. Japanese red spruce, planted in 1910, has been seeding well for several years, and in many places has produced a scattering of seedlings. The form of this tree is very poor, especially when grown pure in the open.

Tentative plans for fire weather forecasting by the Weather Bureau of the Northeast were completed and agreed to by the various State foresters concerned. The work can apparently be started with the opening of the fire season. In accordance with the request of the Northeastern Forest Research Council, plans were made for fire weather study and the matter taken up with the State foresters to determine whether they cared to cooperate financially in putting it into effect. Replies so far have not been as enthusiastic as might be wished.

The graduate course in forest ecology which the station has been offering in the Massachusetts Agricultural College was completed and the final examination given. Three men used the course as credit toward the degree of Master of Science.

PACIFIC NORTHWEST FOREST EXPERIMENT STATION

March has been chiefly a time for preparation of working plans; all members of the force have been so engaged with the result that six plans have been completed in whole, cooperation with the District Office given on two, and some work begun on still others.

McArdle has spent much of his time on sundry Mensuration Studies working plans. The volume table working plan goes much into details, and will doubtless serve as a guide for similar work in the future. The plan

for the field work of the Douglas fir yield study was revised and the second part of this plan was written to provide for the office computational work. All past work in connection with the permanent sample plots in Douglas fir has been systematically reviewed, brought up to date, and a plan made to provide for future work in line with the suggestions of the Regional Investigative Committee.

During the latter part of March, McArdle with Field Assistant Barrett remeasured the Douglas fir permanent sample plots on the Cascade National Forest. These three plots were established in 1910 and are now 69 years old. They average 145 trees to the acre, 11,113 cubic feet and, for trees 12 inches and larger in diameter, 55,341 board feet to the acre. For the period 1910-1925, the average annual growth of these plots was 149 cubic feet total volume, and 1192 board feet merchantable volume per acre.

McArdle spent a little time very profitably in the upper Willamette Valley in searching out new areas where the yield study crews may work this season. Many of the more accessible areas are so heavily cut into or are too uneven-aged to be used in the construction of normal yield tables. As we hope that this is the last season to be spent on this work, attention must mainly be placed on filling in the data already on hand with measurements of plots in the age classes not yet sufficiently covered on one or more of the three site qualities. Munger devoted a day to looking up prospective working areas on the north fork of the Clackamas River. All the firewardens in western Oregon and Washington, as well as many others, have been asked for suggestions as to suitable places for the study. It is planned this season to complete the field work of the Douglas fir yield study by putting two crews of three men each in the field. The first crew begins work April 1, and the second crew a couple of weeks later.

The construction of taper and volume tables for Douglas fir is progressing rapidly. Tables for Site II and Site III are completed, and indications are that they will be applicable to large stands with an accuracy less than -1.5% and to individual trees or small stands with less than + 10% accuracy. The revision of the old volume table which was the average of three qualities of site into tables for each site has reduced the error when applied to individual trees enormously.

Isaac has been preparing a progress report on the effectiveness of seed trees on Douglas fir reproduction, based on five annual observations of a large series of quadrates. This area, which has had a most unfortunate fire history, has now but one seed tree per 10 acres; there are approximately 200 seedlings per acre five seasons after heavy burning, distributed quite uniformly for 300 feet from seed trees.

With D. C. Ingram of Grazing Investigations, Isaac made a trip to Wind River during which time ground was looked over for the cooperative study of Grazing on Logged-off Lands, a phase of our Douglas fir natural reproduction project. A tentative location was picked out for a planting spacing experiment at the same time.

Isaac moved up to Wind River March 31. With the help of three field assistants his first work will be to initiate a planting experiment to test spacings of 10x10, 8x8, 6x6, 5x5, and 4x4 feet with pure Douglas fir.

Simson has completed a progress report on his study of static as an indicator of fire weather.

In response to a suggestion at the Investigative Committee meeting an inexpensive rain gauge has been devised for use at fire dispatchers' stations and on lookouts. A tinsmith has been found who will make them in quantity for $1.70 each. The private protective agencies are interested in getting some, as well as the District office.

A shelter for hygrographs and othef weather instruments has also been made, modified after the Weather Bureau orchard type but easily taken down, and the various agencies are being interested that these fire weather observations may be better standardized and more dependable.

March 26 Simson left for Wind River for the season; his first work will be starting up the meteorological observations and replacing the loop aerial which blew off the roof of the office building this winter and was wrecked.

Langdell, aside from helping on the Douglas fir taper table computations, has been taking off the Weather Bureau records in Portland and Seattle the figures from which to prepare rainfall probability (or drought probability) charts,- a la Zon. Western Oregon and western Washington only have been covered. The data is ready for charting now and includes by 10-day periods from June 20 to September 10, 100 stations, all with more than 10 years' record and some as many as 41. The data looks interesting and valuable and it has been but a small job to compile it this way.

The District Sign Shop has prepared 54 board signs for us for posting experimental areas. This is one way we hope to keep permanent experimental areas from being trespassed upon. A circular letter has also been prepared for the District Office to send to Supervisors regarding protecting experimental areas from trespass and posting them as administrative sites in their tract books, as an added precaution.

A donation of seed of 53 species of Japanese trees has been received from the Imperial University for arboretum use, and by arrangement with the Deans of the Forest Schools at Seattle and Corvallis the consignment has been shared with them. A few other lots of seed have been received, all of which were planted by Isaac while at Wind River recently.

PRIEST RIVER EXPERIMENT STATION

During the month of March nearly every member of the station staff succeeded in completing certain projects so that attention may now be turned to new work.

Gisborne completed a statistical study of weather records for this District which has revealed what appear to be very distinct cycles of monthly and seasonal precipitation during the fire season. A short paper on the subject has been prepared for delivery before the April meeting of the Northwest Science Association, and a longer article on the same subject is nearly ready for submission to the Monthly Weather Review. Forecasts derived by this method have been submitted to the District office and passed on to the Supervisors to be watched this year in order to obtain an opinion of their accuracy and use. A statistical check indicates from 70% to 85% dependability for such forecasts during the past 14 years.

Eleven duff hygrometers are now available for use in this District and Gisborne will leave for the field station early in April to calibrate them. After calibration five widely separated stations will be equipped with these instruments for use during the coming fire season.

During the month Gisborne's progress report on predictions was also completed and copies distributed. The Pacific Northwest Station has already requested a copy for their permanent files. Until the report is edited, rewritten, and published, such requests cannot be complied with.

We were also sorry to be unable to comply with a request from District 5 for 125 extra copies of Applied Forestry Notes No. 58. Our little research paper now has 256 names on its mailing list. Saturday Evening Post circulation is our goal!

Wahlenberg completed during the month one report on field survival of white and yellow pine planting stock, a progress report on stimulating the growth of Engelmann spruce in the nursery, and a reference file or bibliography on planting research containing 2,300 cards. Wahlenberg's plans for the coming season will be completed the first week of April and field work is expected to commence about the 15th. His three months' detail to the experiment station office will end on April 8. On March 2 he delivered an excellent paper on nursery research to the local section of the Society of American Foresters.

Growth and yield studies have been pushed during the month to the point where the compilation of the data from yield plots laid out last summer is now complete except for the compilation of board foot volumes. Haig has also reviewed the District tree volume measurements, tabulating the reports according to species, locality, and age class. Measurements are available on about 4,400 white pine trees for use in checking existing, or making new volume tables.

At the Priest River branch station, Kempff has spent considerable time compiling measurements on the thinning plots. He finds that many of the old computations are useless because of inaccuracies and incompleteness. The available white pine volume table appears to be too coarse in construction for accurate use in computing growth on the thinning plots.

Kempff again reports heavy winter killing at the experiment station. Approximately 60 per cent of the model plantation has been winter killed, and most of the heeled-in stock to have been used this spring has been similarly lost.

The most recent timber sale on the experimental forest, made to salvage stock from a burned area, is now being closed, having produced over $1,000 for the Federal Treasury and over $3,000 for cleaning up the area preparatory to planting. The stock and funds have been made available by the Office of Management for planting this area this spring.

SOUTHERN FOREST EXPERIMENT STATION

With the entire technical force of 11 to 12 men in the field practically continuously, the station has devoted itself to field work on established projects and the extensive surveys.

Elwood L. Demmon, Associate Silviculturist, reported for duty on the 16th, completing our permanent staff. Mr. Demmon is a graduate of the Michigan Forest School and has spent the greater part of his time since graduation in the Tropics, on investigations connected with the growing and breeding of rubber trees and the administration of large rubber plantations. He spent several months at the Lake States Experiment Station before coing to New Orleans.

On March 23 the Southern Forest Research Advisory Committee, recently appointed by Secretaries of Agriculture Gore and Jardine, held its first meeting. Short notice and the great distances involved in travel to New Orleans kept the attendance to seven regularly appointed members out of twenty-one, but these represented a variety of interests. In addition, two members of the committee sent representatives. The program of the Southern Station, as presented by Forbes, who was elected Secretary of the Committee, and the work under way by other agencies, including the forestry departments of Texas and Louisiana and the Agricultural Experiment Station of South Carolina, were thoroughly discussed in two wide-awake sessions. The plans of the Southern Station were approved, great interest being shown by the committee in our extensive surveys in general, and in those concerned with the growth of trees following an early cutting in particular. Resolutions suggesting that the Southern Cypress Manufacturers' Association donate

funds for a continuance of the tupelo study, and commending to the State universities of Georgia and Louisiana the fullest support of their forestry departments, were passed. The committee will also urge the Secretary of Agriculture to undertake increased entomological and pathological work in the South, in cooperation with the Forest Experiment Station. Colonel Greeley was present by invitation throughout the day, and his opening of the meeting and keen interest throughout its proceedings were a strong factor in its success. The committee meets again in September, at which time the annual program of work will be presented and a better opportunity given to discuss plans for the next 12 months.

Colonel Greeley's address at the meeting of the Southern Pine Association was extremely well received and speaker after speaker emphasized the need for the practice of forestry by the pine lumbermen. A resolution endorsing forestry and accepting some of the responsibility for its practice, was adopted by the association, which we believe to be the first lumber manufacturers' association, as such, thus to place itself on record.

Munns visited the Bogalusa-McNeill and Starke Branch stations, completing his stay with us late in February. Dr. Craighead and Mr. St. George of the Bureau of Entomology spent several days at Bogalusa and Starke, and gave us all a much clearer idea than we have hitherto had of the forest insect problems of the South. Show stopped off four days on his way West, going into the field both at Bogalusa and in east Texas.

A needle disease, identified by the Bureau of Plant Industry as the same destructive agency found very frequently on longleaf pine seedlings, has been noted quite universally on the three other pines as well. Numerous dead seedlings of shortleaf have shown the fruiting bodies of this disease, but we do not know as yet whether the disease or drought is chiefly responsible for their demise.

Two days before the deliberate burning of the south pasture at McNeill in February, the entire staff of the Coastal Plain Station, Hadley himself, and a number of neighbors, had the stiffest sort of fight to keep fire from sweeping over the entire experimental section. Our unburned pasture is just about the largest bit of unburned ground in two or three counties of southern Mississippi.

Measurements

The last plots necessary to complete the yield study of southern pines were taken in North Carolina late in March. We were obliged to invade even the Appalachians in our search for shortleaf. The extensive survey crew in east Texas obtained volume table measurements on additional loblolly pines. Unless something unforeseen comes up in compiling the shortleaf figures, the southern pine growth study has now passed into history as a field job, no more data being necessary to the publication of the main report.

Management

The extensive surveys of old cutting, old burns, and turpentine orchards, have amply borne out the predictions of the value of the information obtainable by this method of study. It was originally planned to separate the surveys of regeneration after cutting from the surveys of damage from fire and turpentining. However, as the field work progressed, it became increasingly evident that fire enters into nearly every phase of the work, in fact, in many instances completely obscuring interrelation of other factors. It has therefore seemed unwise, except for purposes of accounting, to keep these studies separate during the present season. Field work has been so far confined to Urania and Bogalusa, La., eastern North Carolina (where McCarthy joined our crew for a week), Florida, South Mississippi, and in east Texas. Because of our desire to see as much of the country as possible, in addition to running strip surveys in selected portions, the actual acreage of strip covered has been lower than anticipated. However, areas for future study have in many instances been located, and the men have received a broad view of the territories visited. Fords have been found absolutely indispensable to the satisfactory conduct of this work.

It is apparent that our original hope of being able to obtain within reasonable time a complete representation of all variety of conditions cannot be fulfilled, and that the compilation of present results will show many gaps in our information. Nevertheless, we feel certain that one or two season's surveys will shed a great deal of light on the southern pine forests as affected by fires, insects, disease, drought, and methods of logging; reproduction, both in advance of cutting and following logging in relation to seed-bearing trees; the distribution of age classes in virgin timber and second growth; degree of release and rate of growth of trees left in logging under a two-cut or a selection system of logging; type and rate of growth of timber on various soils. Shivery's continuing studies and knowledge of soils should give us information of immense future value.

Naval Stores

After a thoroughgoing discussion of the naval stores program with Munns, we decided to handle our going projects more intensively, to expand our studies of individual yield, and to undertake collection of some climatological records. It is planned to weigh individually the gum from every tree in the tests already established, and to scribe a standard width of face, based on a percentage of the total perimeter, on every tree. Last year's study of individual yields will be expanded to include about 250 new faces in second-growth slash, covering a good range of diameters, and a somewhat smaller number of longleaf faces. Unfortunately, we could not obtain permission to weigh the gum from the only virgin crop of longleaf in the vicinity of Starke, but had to content ourselves with a little over 200

faces in a second year working. In connection with a study of the best season to chip, records of rainfall and air temperatures, and soil temperatures and moisture will be taken.

With assistance, Wyman has already carried into effect all of these plans. Regular chipping begun on the longleaf March 9 and on the slash the following day.

The few chains of extensive strip survey run through old orchards were sufficient to disabuse us of the idea that we can hope to establish satisfactory correlations of damage with slight variations in chipping practice.

SOUTHWESTERN EXPERIMENT STATION

The end of the month found Pearson finishing up his work in the District Office and preparing to return to Flagstaff. The outstanding accomplishment during the winter has been the completion of the first draft of a report entitled "Forest Types and Climate in the Southwest." This report is based on three years of intensive study in the San Francisco Mountains, followed by extensive work for the purpose of correlating conditions in the San Francisco Mountains with those prevailing in other parts of the District. Prominent chapter headings in the report are as follows:

Climatic and Soil Conditions: This gives summaries of temperature, precipitation, evaporation, soil moisture and other conditions in all the forest types in the San Francisco Mountain region. There is also a comparison by forest types of conditions in central and northern Arizona with conditions in three other subregions. The appendix will contain records for individual stations in each forest type in available form for reference.

Characteristics of Species: Well known information together with the results of special experiments and observations are assembled here, the idea being to compare the various species in as many ways as possible.

Artificial Extension of the Range of Various Species: Several coniferous species were planted in each forest type from the yellow pine to the Engelmann spruce. The behavior of each species on the various sites is recorded and conclusions drawn.

Limiting Factors in the Distribution of Species: The conclusion presented in an earlier publication - that the upper limit is determined primarily by low temperature and the lower limit by deficient moisture - is confirmed.

The Requirements of Species: Tables show the general range of temperature and moisture encountered in each forest type, and the probable minimum of each factor for each species. Suggestions are given regarding the application of this information in forest management, fire protection and agriculture.

DISTRICT 5

The District Investigative Committee meeting was held March 5 and 6, having been postponed until Show's expected return from Washington. The meeting was attended by Major Bowie of the Weather Bureau, John Miller of the Bureau of Entomology, State Forester Pratt, and Professor Metcalf of the California forest school, besides the regular members. Practically no new projects are to be undertaken, the various agencies planning to concentrate their efforts on the most important projects now under way. The recently adopted forest experiment station bill carries no appropriation, so that plans had to be formulated on our present financial basis. The Program has been put in final shape.

The unexpected transfer of Ayres to the Plumas for timber sale work will delay completion of the volume tables for sugar pine and other species. Preliminary checking of the three white fir tables has been completed and the results sent to Bruce for criticism.

The assembling of fire history data has come to a halt by the assignment of West to the Sequoia. Practically all of his time during March was taken up by Grazing work except the last few days, which he spent in putting the fire history data in shape for taking over by some one else later.

A revision of the article "Prediction of the Second Cut in National Forest Management Plans" has been begun. The article would not have been published for some time so it was desirable to incorporate some more recent material.

LIBRARY

Last month the library loaned 935 books and periodicals, and 113 members of the Service and others consulted the library in person. There were 245 books and articles indexed for the catalogue.

MANUSCRIPT NEWS NOTES

Pacific Northwest

Influence of the Size of Seed on Development of Seedlings of Douglas Fir, Noble Fir, and Western White Pine. Leo A. Isaac.

Natural Reproduction of Douglas Fir, Columbia National Forest. Leo A. Isaac (Progress Report.)

Priest River

Forest Planting in North Idaho. W. G. Wahlenberg. (Ecology.)

Short Cuts in Measuring Tree Heights. I. T. Haig (Journal of Forestry).

Measuring and Forecasting Forest Fire Danger in Northern Idaho. H. T. Gisborne (Board of Review).

Reproduction Following Fire in White Pine Type. J. A. Larsen (J.A.R.)

Relation of Leaf Structure of Conifers to Light and Moisture. J. A. Larsen (J.A.R.)

Sowing and Planting Season for Western Yellow Pine. W. G. Wahlenberg (Page proof, J. A. R.)

Review of Bul. 1294, Role of Fire, H. T. Gisborne (Timberman.)

Southern

Hogs, Fire and Disease vs. Longleaf Pine. W. R. Hine (Lumber Trade Journal).

Northeastern

Forest Fires and Recreation. S. T. Dana (To American Forests and Forest Life).

Appalachian

Influence of Soil Type Upon Root Form of Western Yellow Pine Seedlings. F. Haasis (Board of Review.)

Coincidence Between the Ranges of Forms of Western Yellow Pine, Bark Beetles, and Mistletoe. C. F. Korstian (Science).

Forest Research the Basis for Sound Development of North Carolina's Forest Industries. E. H. Frothingham. (Address given at 13th Annual Meeting of N. C. For. Assn. Feb. 20, 1924 - Circ. of N. C. For. Assn.)

Southwestern

Results of Nursery and Planting Experiments Conducted on the Santa Fe National Forest. Hermann Krauch (Board of Review).

Density of Cell Sap in Forest Trees. G. A. Pearson. (Review of Korstian's "Density of Cell Sap in Relation to Environmental Conditions in the Wasatch Mts. of Utah" Jour. Agric. Res. Vol. 28, pp. 845-907, 1924). (Journal of Forestry, Indian Forester, and English Jour. of Forestry.)

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Zon, R. Experiment Station Work in the Lake States. Lumber World Review. February 10, 1925.